Chapter 14 | Pollution Prevention

Introduction [1]

Source reduction or pollution prevention and the reduction of wastes is the preferred method of managing hazardous wastes. In order to reduce wastes at the source, a business must look at the processes that create the waste and implement actions that will either cause a net reduction in the amount of hazardous waste generated or result in the generation of a waste that is less hazardous.

What is Waste Minimization?

Waste minimization is the reduction of hazardous waste generated before treatment, storage, or disposal of the waste. This includes both source reduction and recycling actions. Recycling can be the use, reuse or reclamation of a hazardous waste. Reclamation of a waste can be done onsite or offsite. If a significant percentage of waste is reclaimed onsite by some form of treatment process and then reused onsite, no treatment permit is required. Waste minimization does **not** include:

- ✓ Concentrating or evaporating the waste to reduce its volume
- ✓ Diluting the waste to reduce its hazardous properties
- ✓ Shifting hazardous wastes from one environmental medium to another
- ✓ Treatment

What are the incentives for businesses to reduce their waste?

- ✓ Reduction in the liability associated with the handling, storage, and disposal of hazardous wastes (cradle to grave liability).
- ✓ Reduction in hazardous waste disposal costs and hazardous material costs.
- ✓ Reduction in employee exposures to hazardous materials and wastes.
- ✓ Reduction in regulatory requirements.

What are some simple steps to take for pollution prevention?

The keys to pollution prevention in metal finishing are to minimize chemical dragout; minimize the amount of water used for rinsing; and recover, reuse, and recycle plating chemicals. Follow this easy checklist for steps to take:

POLLUTION PREVENTION CHECKLIST

Material Handling and Storage		
Y/N	**P2 Opportunities**	**Comments**
	Control Inventory	Do not allow materials to exceed shelf life. Use materials on a first-in, first-out basis.
	Buy appropriate amounts	Buy materials in small quantities if only small amounts are required.
	Cover outdoor storage	Divert clean stormwater away from storage areas.
	Install spill containment	Spills can be contained and managed, so it reduces wastewater treatment upsets.

Dragout

Y/N	P2 Opportunities	Comments
	Lengthen dragout time	Allows more chemicals to drip back to process tank, so reduces the amount of chemical introduced in rinse water.
	Establish dragout timing	Post dragout times at tanks to remind employees
	Install drain boards or drip guards	Boards and guards minimized spillage between tanks and are sloped away from rinse tanks so dragout fluids drain back to plating tanks.
	Install drip bars	Drip bars allow parts to be drained without handling by personnel.
	Mechanize dragout	Eliminates possibility of employees using too short a dragout time. Maintains product QA/QC standards if timing is set properly.
	Reduce pockets on parts	Place parts on dragout rack to minimize chances of chemical pooling in corners or in other pockets.

Rinsing

Y/N	P2 Opportunities	Comments
	Use static rinses	Static rinses usually follow the plating bath and capture the most concentrated dragout for returning to the plating bath or for metal recovery.
	Use countercurrent rinses	These rinses dramatically reduce the amount of water required for rinsing and therefore reduce the amount of wastewater to be treated or sent for metal recovery.
	Use conductivity sensor	This sensor gives an indication of the cleanliness of the rinse water. It can be designed to trigger clean rinse water flow when the tank water gets too dirty. Sensors also allow better QA/QC.
	Use spray fog rinsing	Reduces rinse water amount required and can also be used over plating baths.
	Use foot pump or photo sensor to activate rinse	These items allow the use of a sensor to activate rinse water only when processing parts. A photo sensor may be used on automatic plating lines.
	Agitate rinse bath	Agitation promotes better rinsing. Agitate water or part.
	Install flow restrictors	To restrict flow.
	Install flow control meters	To control flow.

Material Recycle, Reuse, and Recovery

Y/N	P2 Opportunities	Comments
	Reuse deionized rinse water	Depending on product, this rinse water can be reused in a plating bath as evaporated water makeup.
	Ion exchange on rinse water	Ion exchange can be used to concentrate metals in rinse waters and metal can be recovered from the ion exchange acid regenerant stream.
	Reuse spent acid/alkaline	Spent acid can be used to neutralize an alkaline waste stream. Spent alkali can be used to neutralize an acid waste stream.

Y/N	P2 Opportunities	Comments
	Reverse osmosis	Concentrates dragout for reuse in plating bath; the water stream can then be reused.
	Electrowinning	Recover metals from spent plating baths or ion exchange acid regenerant streams.
	Reuse mild acid	Use mild acid rinse water as effluent to rinse following alkaline cleaning bath. Improves efficiency of rinse, so less rinse water is required.

Process Modification

Y/N	P2 Opportunities	Comments
	Eliminate cyanide baths	Change to a non-cyanide plating bath. Alternative chemicals are available with the exception of copper strike.
	Use deionized (DI) water	Use DI water in plating baths, static rinses, and if practical in running rinses. DI water reduces impurities in the plating bath to extend its life and minimizes the precipitation of minerals in water as sludge.
	Segregate waste streams	Increases recovery and treatment technology efficiencies. Acidic/alkaline. Chrome/non-chrome. Concentrate/dilute. Chelated/non-chelated. Cyanide/non-cyanide.
	Use different process	Replace toxic cadmium plating with relatively nontoxic aluminum ion vapor deposition to achieve metal hardening properties.
	Use water-based cleaners	Use aqueous (water-based) cleaning in place of perchloroethylene vapor degreasing operations. Water-based cleaning systems are technically feasible and cost effective.
	Eliminate intermittent jobs	Stop performing small plating operations that generate intermittent waste streams that personnel are not familiar with treating.
	Convert to dry floor	Reduces chances of spills reaching floor drains or causing upset in wastewater pretreatment plant.

Process Operation and Maintenance

Y/N	P2 Opportunities	Comments
	Increase bath temperature	Evaporate bath water so relatively clean waste rinse water can be reused as bath makeup water. Reduces solution viscosity so more chemical drains back to process tank during dragout. *Do Not Use Cyanide or Hexavalent Chromium Baths.*
	Optimize bath concentrations	Only replace plating chemical when necessary. This practice lengthens bath life.
	Install bath filter	Filter can remove particulates and trace contaminant organics in the process bath, lengthens bath life. Use a filter that can be unrolled, cleaned and reused.
	Raw material purity	Use high quality raw materials in bath so bath will not become contaminated too quickly.
	Reduce bath dumps	Optimize bath operation so bath dumps are infrequent.
	Spill cleanup procedures	Establish procedures for clean up of a spill. Mitigates chance of spill being discharged to wastewater treatment plant.
	Perform preventative maintenance	Routinely check for leaks in valves and fittings. Repair immediately.

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REFERENCES:

1. California Health & Safety Code Section 25244.19 to 25244.21

U.S. EPA Metal Finishing Pollution Prevention and Waste Minimization Assistance Materials

Fact Sheets *(1-9) available in both English and Spanish*:

1. Reverse Osmosis Applications for Metal Finishing Operations
2. Innovative Cooling Systems for Hard Chrome Plating
3. Modifying Tank Layouts to Improve Process Efficiency
4. Reducing Rinse Water Use With Conductivity Control Systems
5. Reducing Dragout with Spray Rinses
6. Finding an Alternative to Solvent Degreasing
7. Metal Recovery and Wastewater Reduction Using Electrowinning
8. Extending Electroless Nickel Bath Life Using Electrodialysis
9. Extending Metal Finishing Bath Life

Mini-fact Sheets *available in English only*:

1. Dragout Reduction Through Spray Rinsing Over Heated Baths
2. Dragout Reduction Through Use of Hoist-Mounted Spray Systems
3. Dragout, Water Use, and Wastewater Generation Reduction Through Spray Rinsing Over Heated Baths
4. Improving Paint Transfer Efficiency with HVLP Spray Guns
5. Metal Recovery Using Ion Exchange and Electrowinning
6. Reusing Chrome Scrubber Water in Plating Baths
7. Sodium Metabisulfate Use Reduction in Treatment Operations
8. Water Use and Wastewater Generation Reduction Using Conductivity Control Systems
9. Water Use and Reduction Using Air-Atomizing Spray Guns
10. Water Use Reduction Using Flow Restrictors and Timers

Video *in English and Spanish:* "Pollution Prevention for Metal Platers". Available at no cost from the HMD Pollution Prevention Specialist (619) 338-2324 (one per shop please).